Real-Time Data Warehousing and On-Line Analytical Processing at Aberdeen Test Center's Distributed Center

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Report Documentation Page

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ATC Distributed Center

- 32 node Linux cluster (64 processors)
- 4.4 TB Panasas storage
- Hosted at ARL-MSRC – leverages existing support

Purpose

1. Provide real-time test data verification, analysis and warehousing
2. Provide OLAP tools for test data analysis and data mining

ATC DC Proposal

•Achieve real-time data fusion to provide real-time analytic and decision support

•Establish parallel post processing capabilities to effect knowledge extraction

•Institute a high performance data warehouse

•Real time quality control – utilizing historic data sets

ATC DC Timeline

- Oct-2003 - Proposal selected
- 4-May-2004 - System Delivered
- **28-June-2004 - System on network accepting connections**
- July-2004 - System Testing Complete
- Sept-2004 - Current data handling process (SunE10K) ported to DC
- Sept-2004 - Kerberized filters in place to allow web access to data warehouse (ARL-PET Dr. Walter Landry)
- **Nov-2004 – OS Change from RHES to SuSE ES9 – Slave node NFS issues**
- Dec-2004 - Processing apps running with mpiJava
- Dec-2004 - Tomcat running in a JavaParty environment
- Nov/Dec-2004 - Army Science Conference demo of Data Warehouse
- Feb-2005 - Processing apps running with Javaparty
- April-2005 - Automated scripts to poll ATC concentrator for new data files

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Real Time Data Fusion

- Test data collected via on-board instrumentation -VxWorks based computer. Each instrument produces a continuous time history record of up to 250 parameters, up to 10KHz ea. Files closed approx. every 15-30 minutes. Single file size from 10KB to 100MB. Test item may have multiple instruments recording simultaneously.
- Must move raw data files from instrumentation to cluster for processing. Wireless or PC-Card harvesting.
- When raw data files show up on cluster – Java based conversion (raw to HDF5) process must fire automatically.
- Report applications fire, creating reports (PDF, Excel etc.) on the just processed data.
- Reports auto-published to web based Digital Library for consumption by decision makers.
- HDF5 data files registered in data warehouse.

Real Time Data Fusion (cont)

Flash Drive

Munson Test Area

'while(true)' bash script to scp data files from concentrator to DC. ATC firewall allows DC ssh traffic into concentrator. SSH keys used to allow password-less (and unattended) ssh commands.

ata files to concentrator
.com/products/antflow/

10-100Mb/Sec

100Mb/Sec

Data File Concentrator (Linux)

Aberdeen Test Center Distributed Center Linux Cluster @ARL-MSRC

Flash Drive

Perryman Test Ar

AntFlow used to start processing scripts

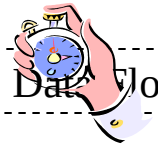
< 2 minutes

Polling required, as automated file transfer not achievable - increases latency and complexity

< 2 minutes

< 10 minutes

Data Flow



< 2 minutes

Partnering for Success ATC Aberdeen Test Center

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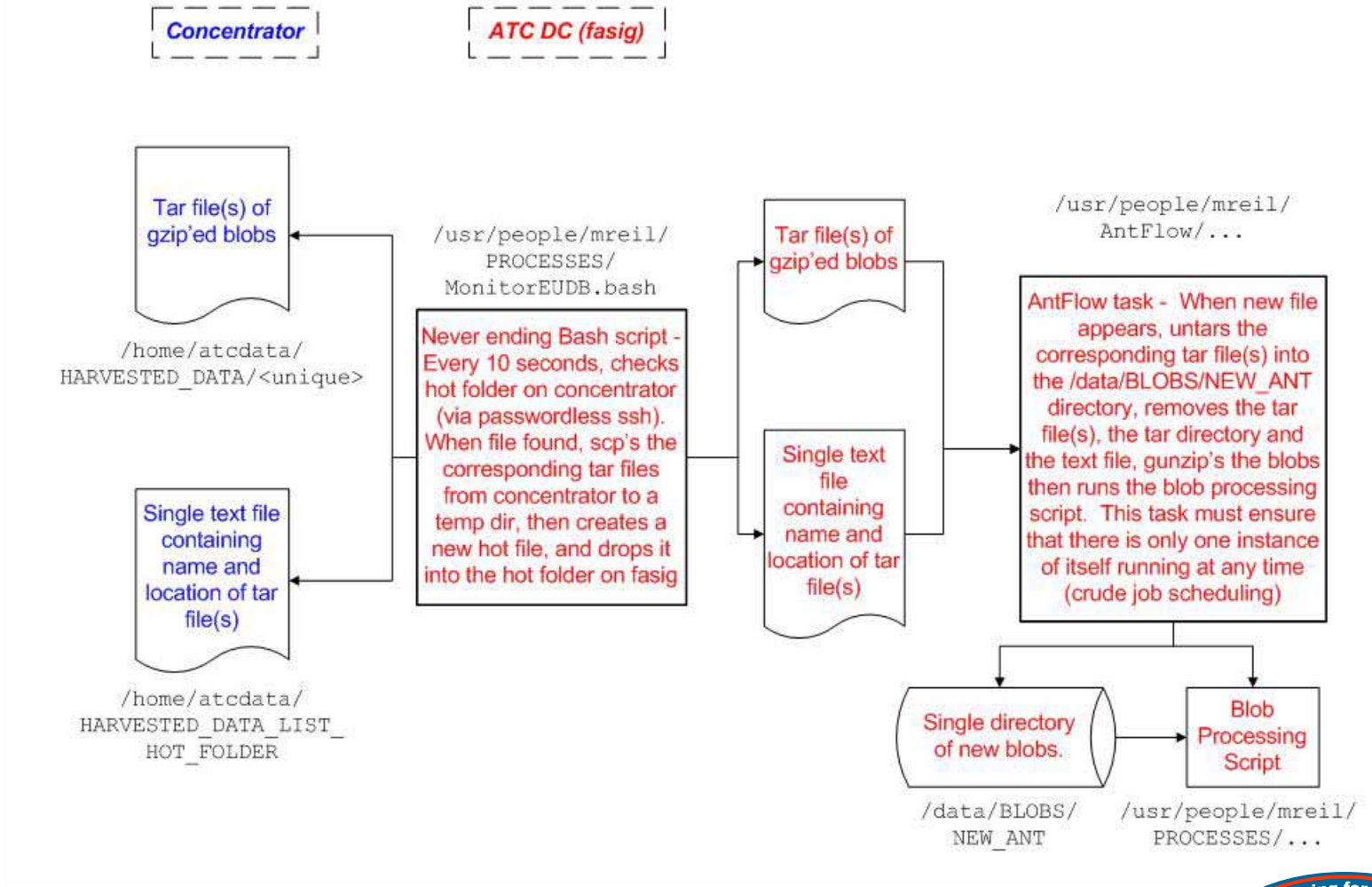
Real Time Data Fusion (cont)



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•Achieve real-time data fusion to provide real-time analytic and decision support

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Establish post processing capabilities to effect knowledge extraction

- Raw data files are converted to a common format – HDF5 chosen. (http://hdf.ncsa.uiuc.edu/HDF5)
- Existing library of java classes and *nix scripts to convert raw data files to HDF5. Originally single threaded java code, extended to utilize multiple java threads. Worked well on SMP machines (Sun E10K), but not on distributed processor/memory systems (Linux cluster). Processing is easy to parallelize. Each thread gets one data file to convert. Java classes used lots of memory – object oriented nature of code contributed to this – each data point was a java object. Garbage collection times also large.
- mpiJava – thin java wrapper around MPICH. Created java app that distributed processing of data files via message passing (MPI). Worked well, but required knowledge of the MPI framework and library. Also dependent on availability of MPICH for your OS/disto.

Establish post processing capabilities to effect knowledge extraction (cont)

- JavaParty – http://www.ipd.uka.de/JavaParty/features.html - *allows easy port of multi-threaded Java programs to distributed environments such as clusters. Regular Java already supports parallel applications with threads and synchronization mechanisms. While multi-threaded Java programs are limited to a single address space, JavaParty extends the capabilities of Java to distributed computing environments.

*From the JavaParty Web Site

Multiple Java Threads

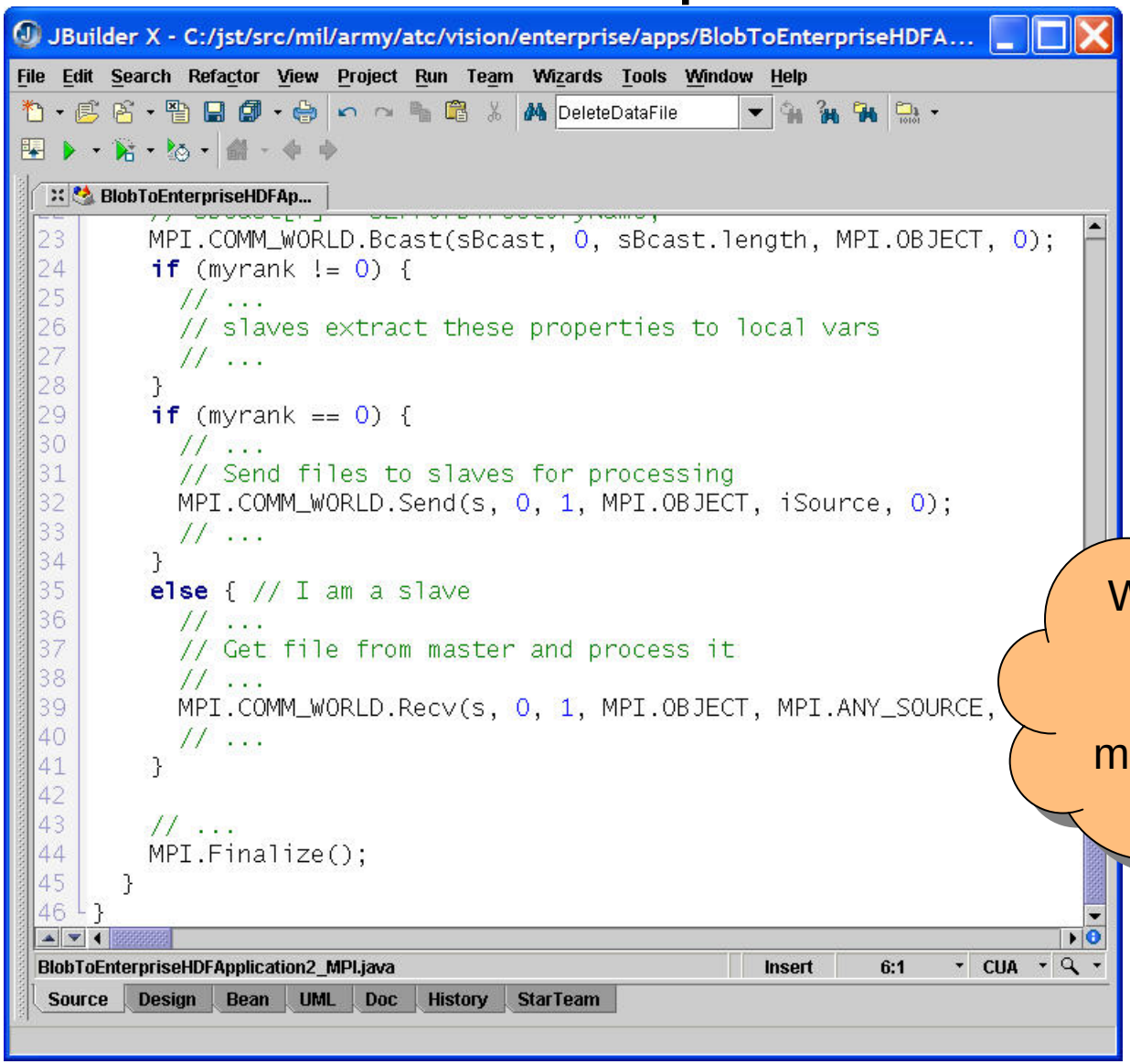
```
public class ConvertToHDF5 extends Thread {
        ...
        ...
        ConvertToHDF5 worker = new ConvertToHDF5(...);
        worker.start();
        ...
        ...

        public void run() {
                ...
                ...
        }

}
```

Each thread is mapped to a physical processor by the JVM (Java Virtual Machine) – for SMP machines only!

mpiJava



Works well on SMP or Distributed machines – it is just MPI!

JavaParty

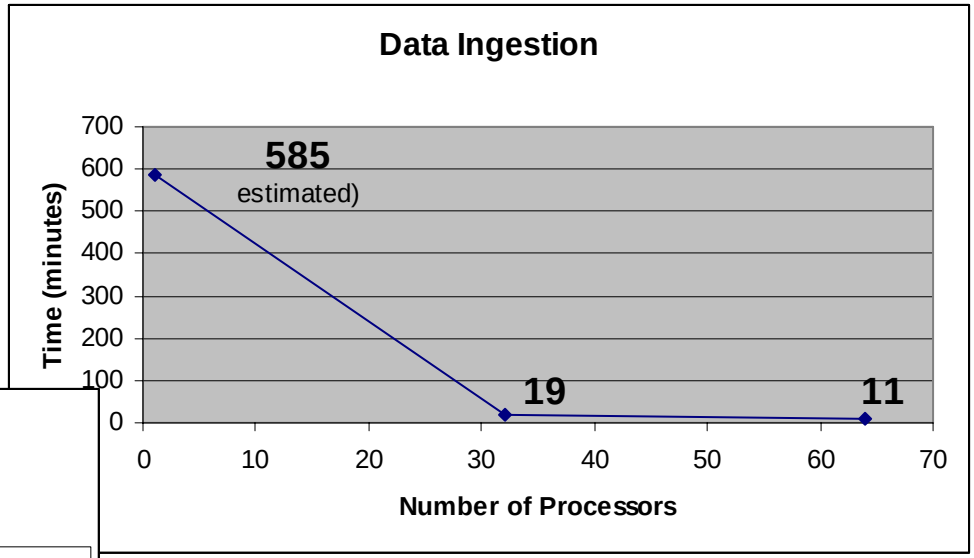
```
public remote class HelloJP {
        public void hello() {
                // Print on the console of the virtual machine where the object lives
                System.out.println("Hello JavaParty!");
        }
        public static void main(String[] a
                for (int n = 0; n <
                        // Create a remote ob
                        HelloJP wo
                        // Remotely invok
                        world.hello
                }
        }
}
```

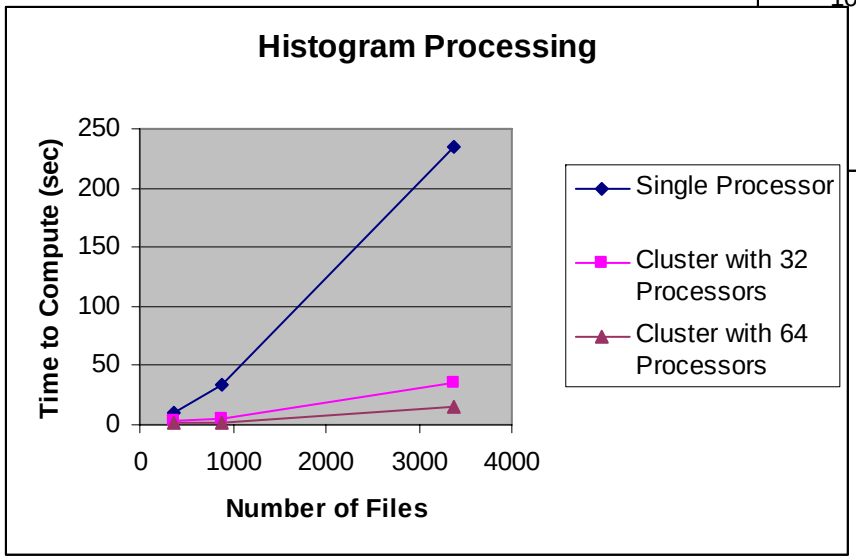
Each new ‘remote’ object is created on a slave processor. User can control which processor with the /** @*i* */ construct in code

JavaParty

- Uses ssh to spawn JVMs on slave nodes of cluster (similar to MPI)
- One JVM per slave processor.
- Controlled via .jp-nodefile (similar to ‘machines’ file used with MPI).
- Pure java implementation – no native libraries required.
- Uses RMI to serialize java objects between JVMs.
- High performance RMI engine supplied (KaRMI).
- Possible to use without ‘breaking’ java source code – extend ‘RemoteThread’ class instead of using ‘remote’ keyword.
- This is the framework that we are now using.
- Regular java – invoke application :
  - `java <classname>`
- JavaParty – invoke application :
  - `jpinvite <classname>`

Establish post processing capabilities to effect knowledge extraction (cont)





ATC DC Proposal

•Achieve real-time data fusion to provide real-time analytic and decision support

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•Institute a high performance data warehouse

•Real time quality control – utilizing historic data sets

What is OLAP?

- Online Analytical Processing
- Software that enables decision support via rapid queries to large databases that store ~~corporate~~ data in multidimensional hierarchies and views.

T&E

Institute a high performance data warehouse

•PostgreSQL 7.4 installed on dedicated filesystem (500 MB RAID5 JBOD) on head node.

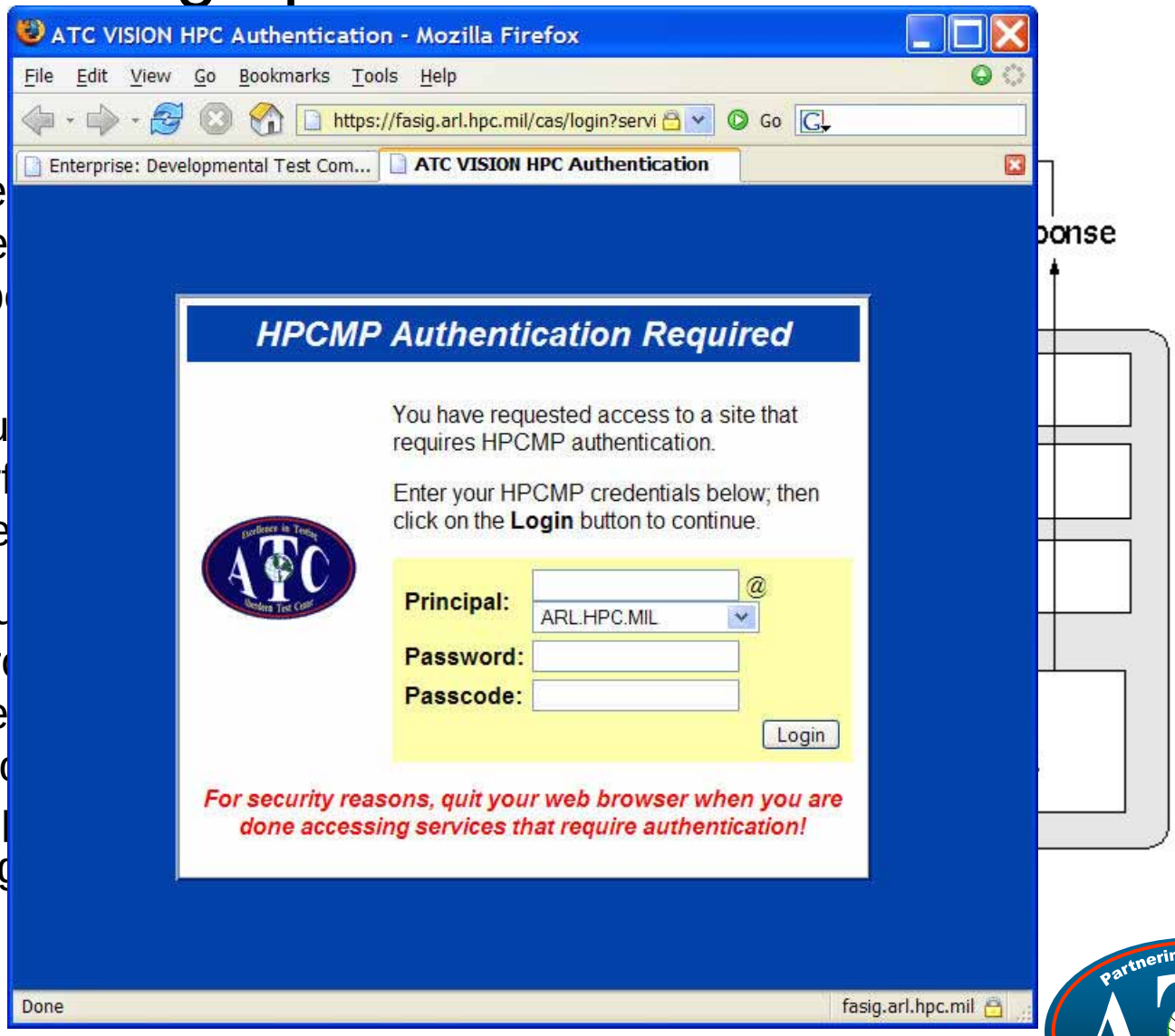
•Java based web application ported to JavaParty. Allows data set queries submitted by the web app user to be run on all nodes of the cluster in parallel (for aggregate operations). Tomcat started via 'javaparty' rather than the standard 'java'. This allows servlets to create remote objects, which run on the remote nodes.

•Kerberos/SecureID authentication module written by PET IMT – Dr. Walter Landry @ ARL. Uses J2EE servlet filter framework and cookies to authenticate each HTTP request.

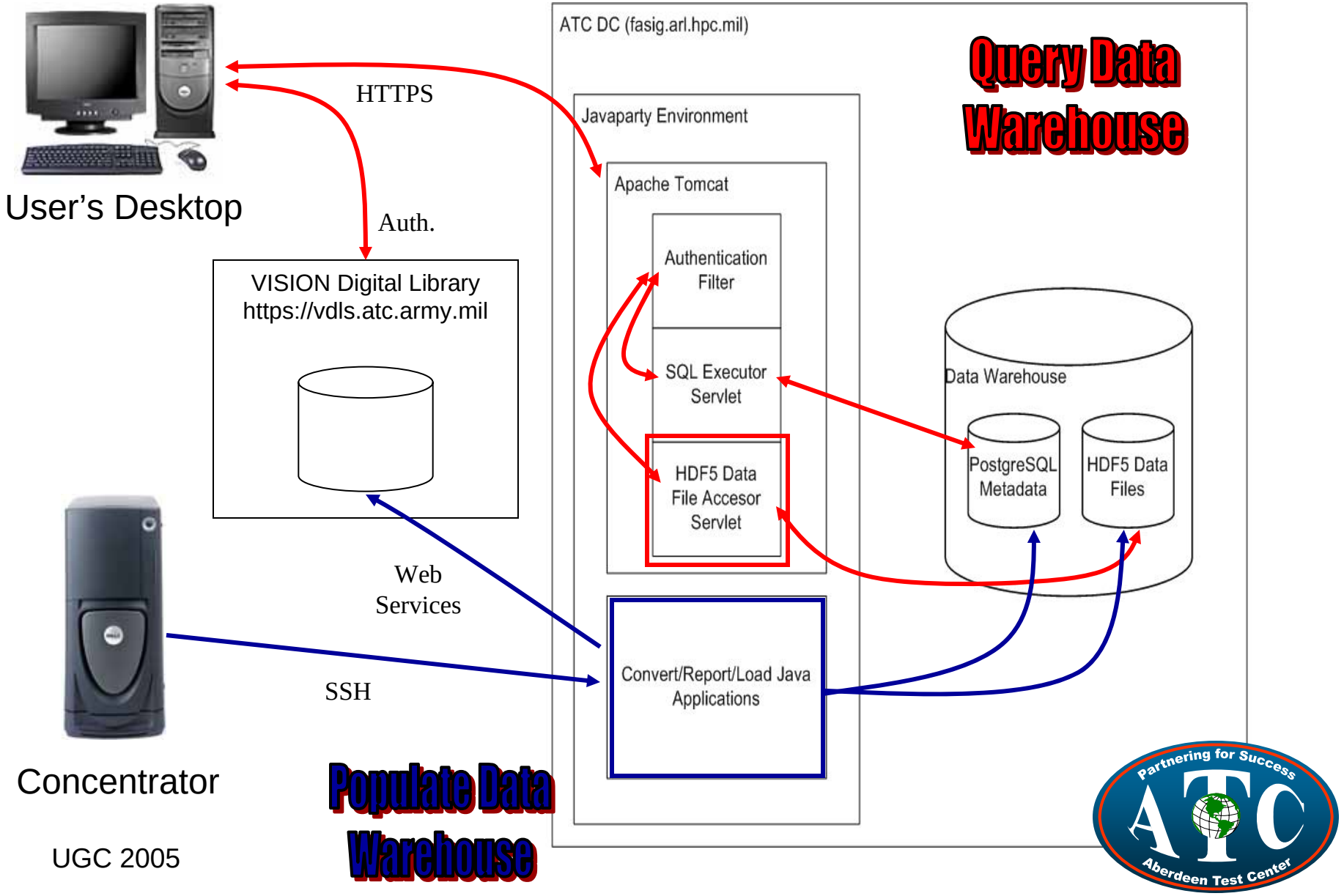
•GUI is java applet, which runs in users browser. GUI presents metadata to user, who selects filter settings, and applet then submits SQL statement on users behalf to data warehouse. List of data sets is returned – user can then request composite routines be run on the set of data files – these are run on the entire cluster in the JavaParty environment.

Institute a high performance data warehouse

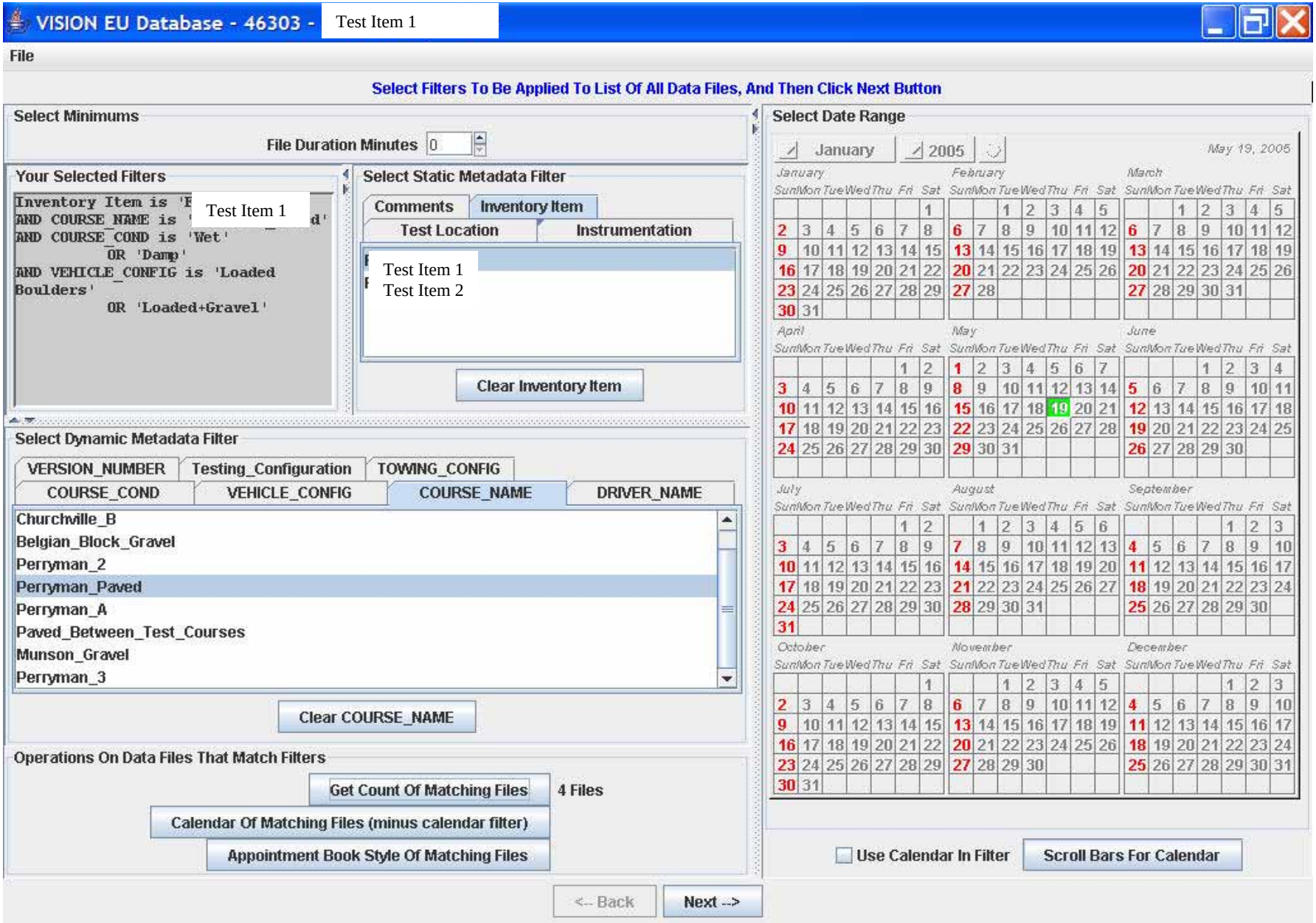
- Filter re
  HTTP re
  the prop
  page.
- User su
  filter perf
  encrypte
- Each su
  goes thr
  containe
  for this t
  request
  login pag



Institute a high performance data warehouse



Screenshots Of OLAP GUI


VISION EU Database - 46303 -
Test Item 1
File
Select Filters To Be Applied To List Of All Data Files, And Then Click Next Button
Select Minimums
File Duration Minutes
0
Your Selected Filters
Inventory Item is 'E
AND COURSE_NAME is '
d'
AND COURSE_COND is 'Wet'
OR 'Damp'
AND VEHICLE_CONFIG is 'Loaded Boulders'
OR 'Loaded+Gravel'
Test Item 1
Select Static Metadata Filter
Comments
Inventory Item
Test Location
Instrumentation
Test Item 1
Test Item 2
Clear Inventory Item
Select Dynamic Metadata Filter
VERSION_NUMBER
Testing_Configuration
TOWING_CONFIG
COURSE_COND
VEHICLE_CONFIG
COURSE_NAME
DRIVER_NAME
Churchville_B
Belgian_Block_Gravel
Perryman_2
Perryman_Paved
Perryman_A
Paved_Between_Test_Courses
Munson_Gravel
Perryman_3
Clear COURSE_NAME
Operations On Data Files That Match Filters
Get Count Of Matching Files
4 Files
Calendar Of Matching Files (minus calendar filter)
Appointment Book Style Of Matching Files
Select Date Range
January
2005
May 19, 2005
Use Calendar In Filter
Scroll Bars For Calendar
<-- Back
Next -->

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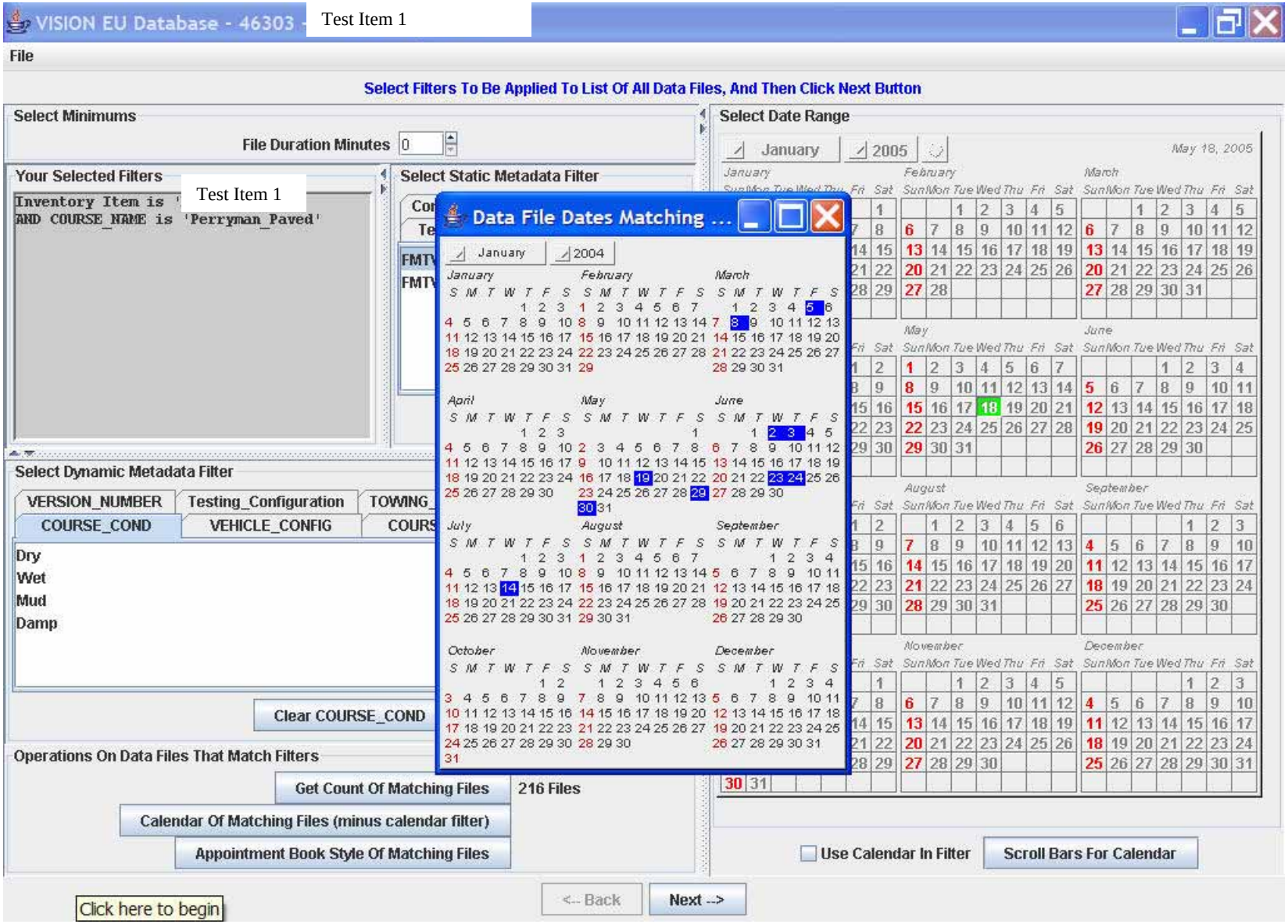
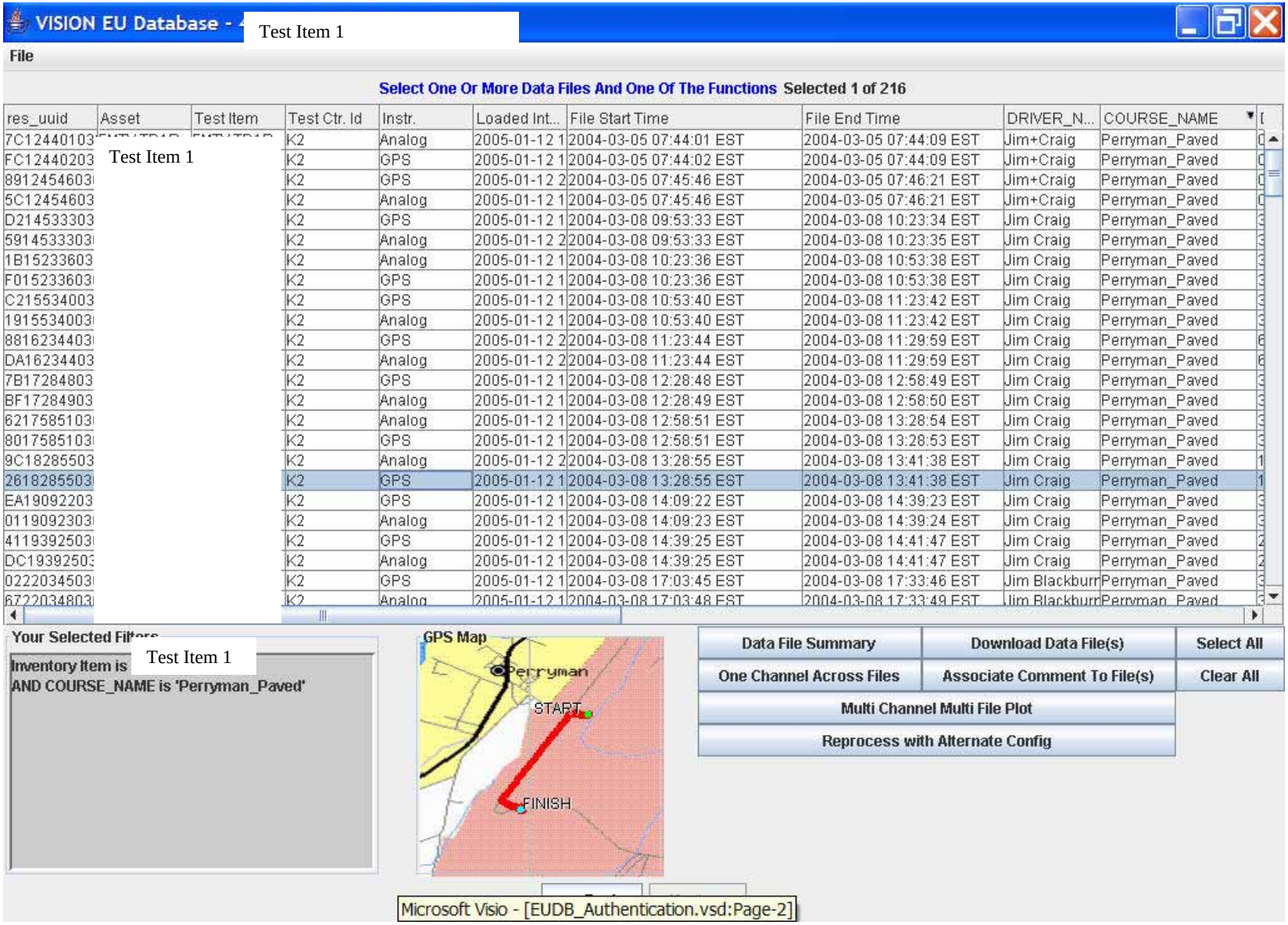
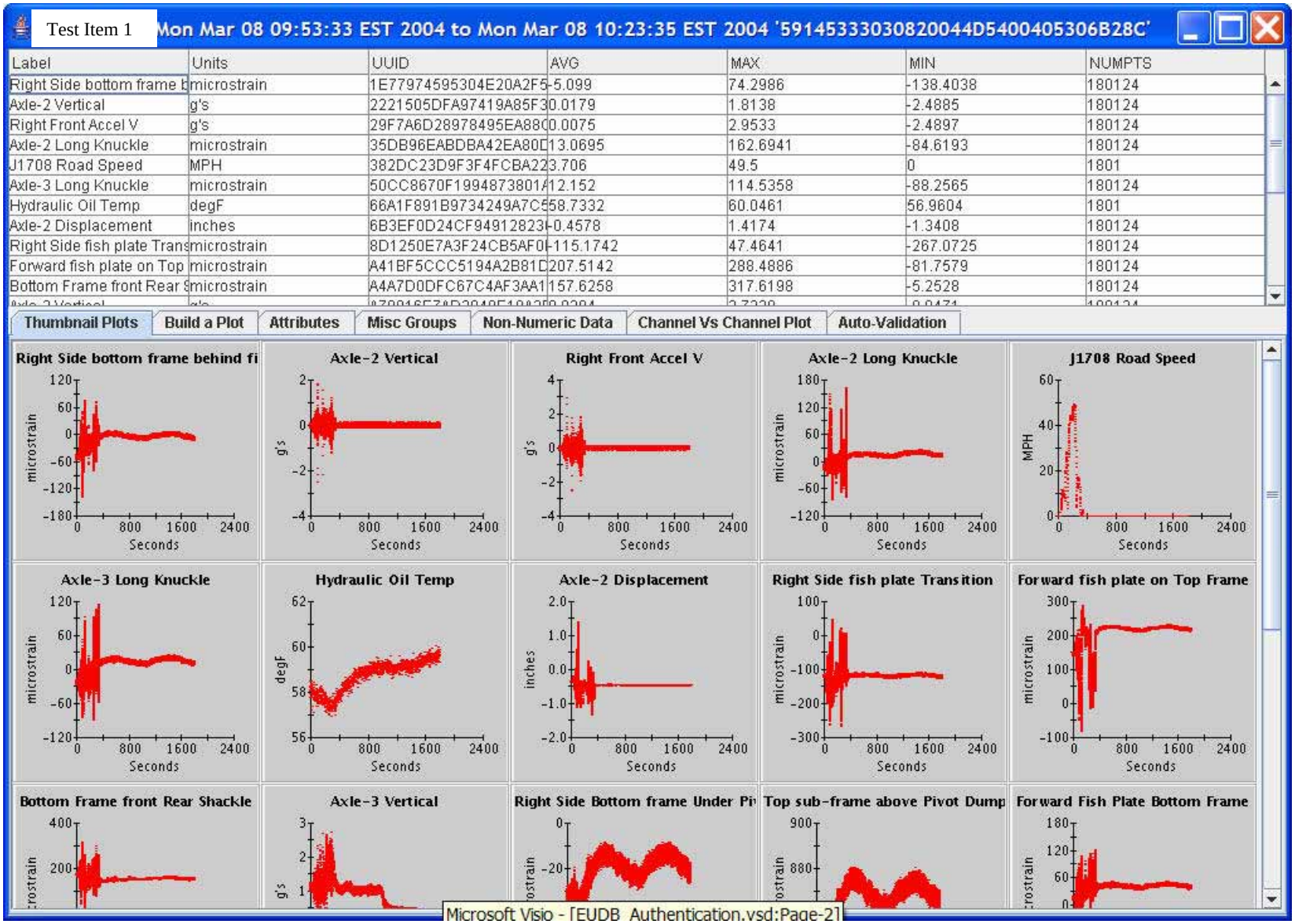

VISION EU Database - 46303 -
Test Item 1
File
Select Filters To Be Applied To List Of All Data Files, And Then Click Next Button
Select Minimums
File Duration Minutes
0
Your Selected Filters
Inventory Item is '
AND COURSE_NAME is 'Perryman_Paved'
Test Item 1
Select Static Metadata Filter
Select Dynamic Metadata Filter
VERSION_NUMBER
Testing_Configuration
TOWING_
COURSE_COND
VEHICLE_CONFIG
COURS
Dry
Wet
Mud
Damp
Clear COURSE_COND
Operations On Data Files That Match Filters
Get Count Of Matching Files
216 Files
Calendar Of Matching Files (minus calendar filter)
Appointment Book Style Of Matching Files
Data File Dates Matching ...
January
2004
Select Date Range
January
2005
May 18, 2005
Use Calendar In Filter
Scroll Bars For Calendar
Click here to begin
<-- Back
Next -->

UGC 2005


VISION EU Database -
Test Item 1
File
Select One Or More Data Files And One Of The Functions Selected 1 of 216
res_uuid
Asset
Test Item
Test Ctr. Id
Instr.
Loaded Int...
File Start Time
File End Time
DRIVER_N...
COURSE_NAME
Test Item 1
Your Selected Filters
Inventory Item is
AND COURSE_NAME is 'Perryman_Paved'
Test Item 1
GPS Map
Perryman
START
FINISH
Data File Summary
Download Data File(s)
Select All
One Channel Across Files
Associate Comment To File(s)
Clear All
Multi Channel Multi File Plot
Reprocess with Alternate Config
Microsoft Visio - [EUDB_Authentication.vsd:Page-2]


Test Item 1
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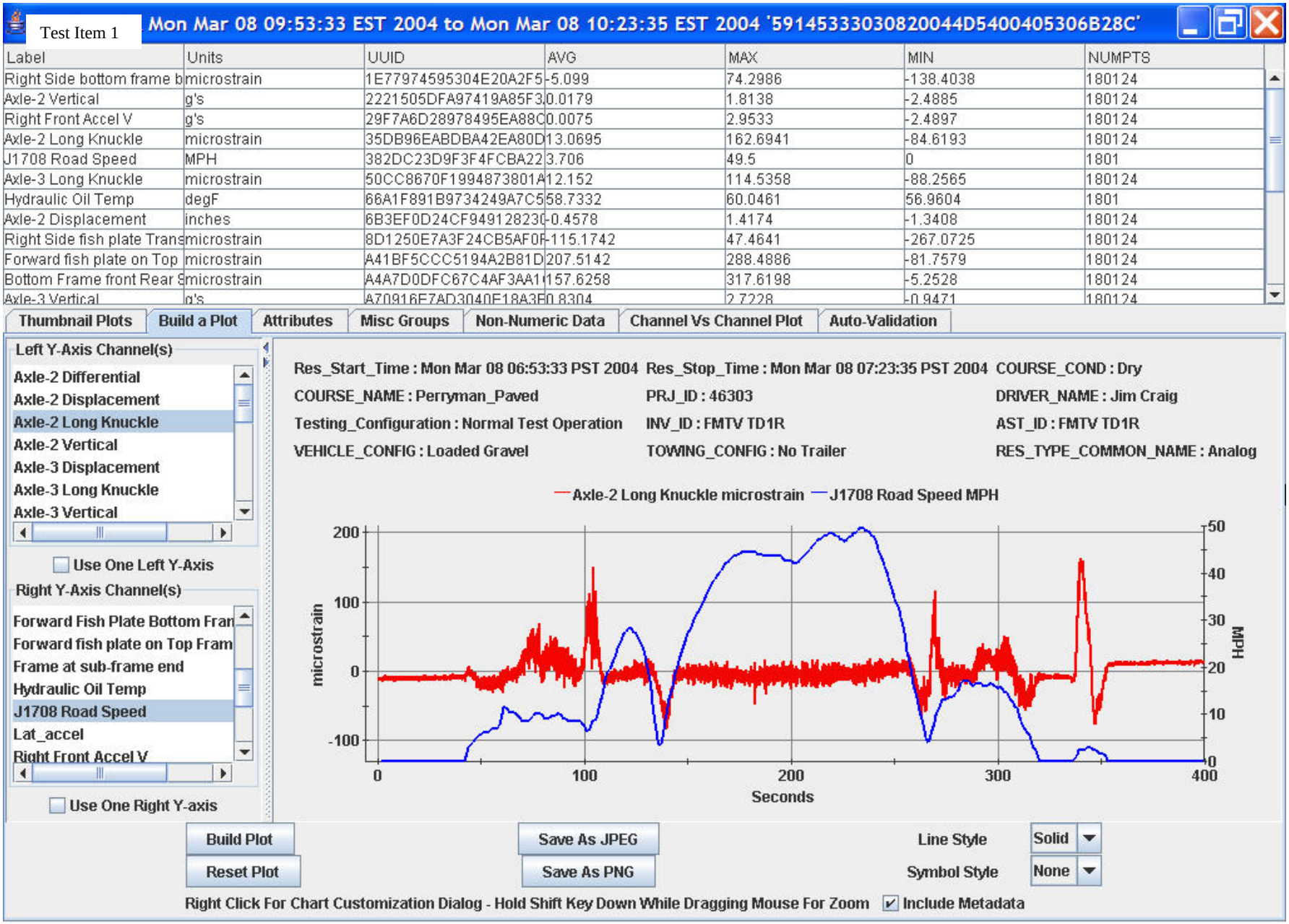
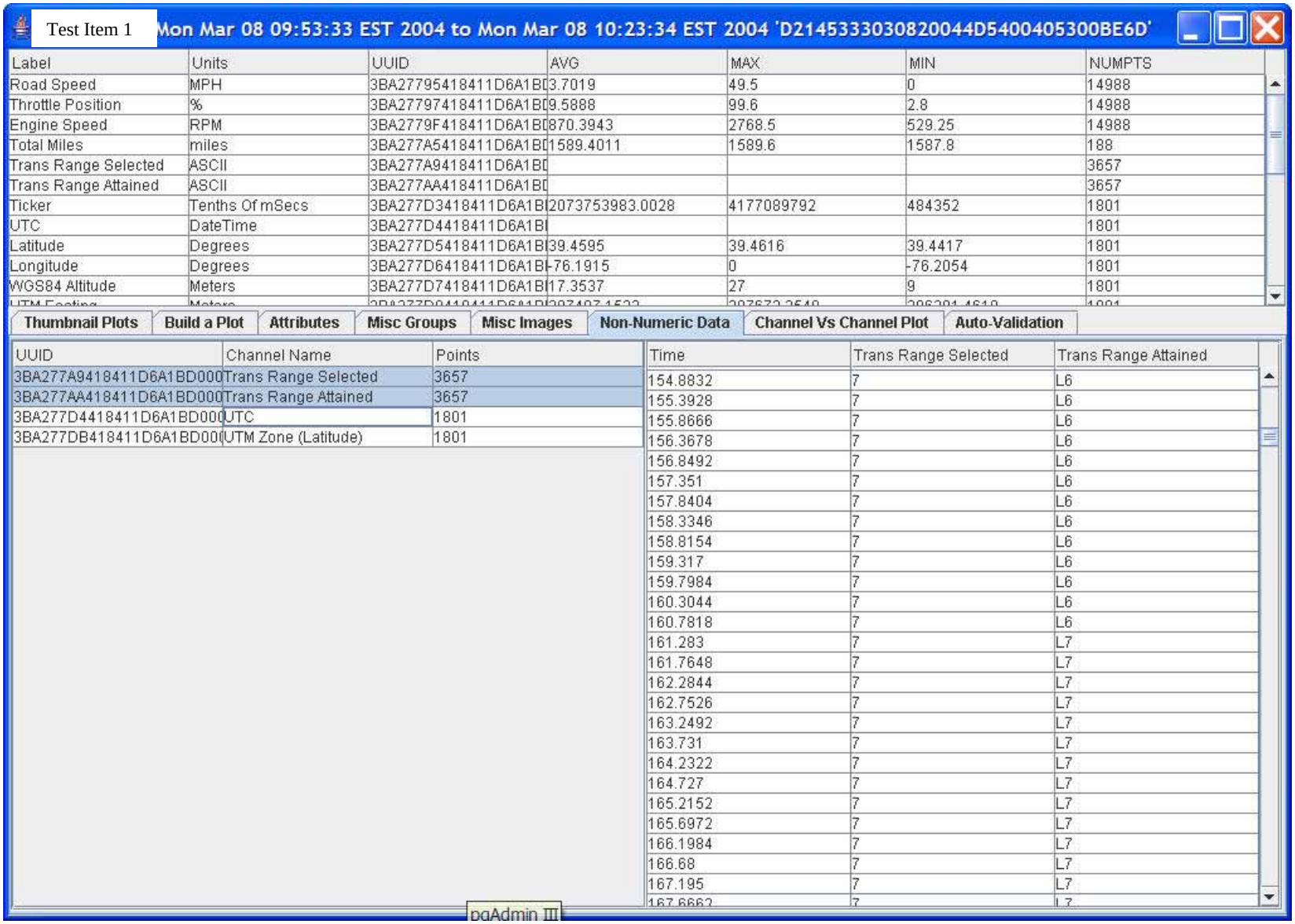
Label | Units | UUID | AVG | MAX | MIN | NUMPTS
Right Side bottom frame b | microstrain | 1E77974595304E20A2F5 | -5.099 | 74.2986 | -138.4038 | 180124
Axle-2 Vertical | g's | 2221505DFA97419A85F3 | 0.0179 | 1.8138 | -2.4885 | 180124
Right Front Accel V | g's | 29F7A6D28978495EA880 | 0.0075 | 2.9533 | -2.4897 | 180124
Axle-2 Long Knuckle | microstrain | 35DB96EABDBA42EA80D | 13.0695 | 162.6941 | -84.6193 | 180124
J1708 Road Speed | MPH | 382DC23D9F3F4FCBA22 | 3.706 | 49.5 | 0 | 1801
Axle-3 Long Knuckle | microstrain | 50CC8670F1994873801A | 12.152 | 114.5358 | -88.2565 | 180124
Hydraulic Oil Temp | degF | 66A1F891B9734249A7C5 | 58.7332 | 60.0461 | 56.9604 | 1801
Axle-2 Displacement | inches | 6B3EF0D24CF94912823 | -0.4578 | 1.4174 | -1.3408 | 180124
Right Side fish plate Trans | microstrain | 8D1250E7A3F24CB5AF0 | -115.1742 | 47.4641 | -267.0725 | 180124
Forward fish plate on Top | microstrain | A41BF5CCC5194A2B81D | 207.5142 | 288.4886 | -81.7579 | 180124
Bottom Frame front Rear S | microstrain | A4A7D0DFC67C4AF3AA1 | 157.6258 | 317.6198 | -5.2528 | 180124
Thumbnail Plots | Build a Plot | Attributes | Misc Groups | Non-Numeric Data | Channel Vs Channel Plot | Auto-Validation
Right Side bottom frame behind fi
Axle-2 Vertical
Right Front Accel V
Axle-2 Long Knuckle
J1708 Road Speed
Axle-3 Long Knuckle
Hydraulic Oil Temp
Axle-2 Displacement
Right Side fish plate Transition
Forward fish plate on Top Frame
Bottom Frame front Rear Shackle
Axle-3 Vertical
Right Side Bottom frame Under Pi
Top sub-frame above Pivot Dump
Forward Fish Plate Bottom Frame
Seconds
microstrain
g's
degF
inches
MPH
Microsoft Visio - [EUDB_Authentication.vsd:Page-2]


Test Item 1
Mon Mar 08 09:53:33 EST 2004 to Mon Mar 08 10:23:35 EST 2004 '59145333030820044D5400405306B28C'
Label | Units | UUID | AVG | MAX | MIN | NUMPTS
Right Side bottom frame b | microstrain | 1E77974595304E20A2F5 | -5.099 | 74.2986 | -138.4038 | 180124
Axle-2 Vertical | g's | 2221505DFA97419A85F3 | 0.0179 | 1.8138 | -2.4885 | 180124
Right Front Accel V | g's | 29F7A6D28978495EA88C | 0.0075 | 2.9533 | -2.4897 | 180124
Axle-2 Long Knuckle | microstrain | 35DB96EABDBA42EA80D | 13.0695 | 162.6941 | -84.6193 | 180124
J1708 Road Speed | MPH | 382DC23D9F3F4FCBA22 | 3.706 | 49.5 | 0 | 1801
Axle-3 Long Knuckle | microstrain | 50CC8670F1994873801A | 12.152 | 114.5358 | -88.2565 | 180124
Hydraulic Oil Temp | degF | 66A1F891B9734249A7C5 | 58.7332 | 60.0461 | 56.9604 | 1801
Axle-2 Displacement | inches | 6B3EF0D24CF949128230 | -0.4578 | 1.4174 | -1.3408 | 180124
Right Side fish plate Trans | microstrain | 8D1250E7A3F24CB5AF0F | -115.1742 | 47.4641 | -267.0725 | 180124
Forward fish plate on Top | microstrain | A41BF5CCC5194A2B81D | 207.5142 | 288.4886 | -81.7579 | 180124
Bottom Frame front Rear S | microstrain | A4A7D0DFC67C4AF3AA1 | 157.6258 | 317.6198 | -5.2528 | 180124
Axle-3 Vertical | g's | A70916E7AD3040E18A3E | 0.8304 | 2.7228 | -0.9471 | 180124
Thumbnail Plots
Build a Plot
Attributes
Misc Groups
Non-Numeric Data
Channel Vs Channel Plot
Auto-Validation
Left Y-Axis Channel(s)
Axle-2 Differential
Axle-2 Displacement
Axle-2 Long Knuckle
Axle-2 Vertical
Axle-3 Displacement
Axle-3 Long Knuckle
Axle-3 Vertical
Use One Left Y-Axis
Right Y-Axis Channel(s)
Forward Fish Plate Bottom Fran
Forward fish plate on Top Fram
Frame at sub-frame end
Hydraulic Oil Temp
J1708 Road Speed
Lat_accel
Right Front Accel V
Use One Right Y-axis
Res_Start_Time : Mon Mar 08 06:53:33 PST 2004
Res_Stop_Time : Mon Mar 08 07:23:35 PST 2004
COURSE_COND : Dry
COURSE_NAME : Perryman_Paved
PRJ_ID : 46303
DRIVER_NAME : Jim Craig
Testing_Configuration : Normal Test Operation
INV_ID : FMTV TD1R
AST_ID : FMTV TD1R
VEHICLE_CONFIG : Loaded Gravel
TOWING_CONFIG : No Trailer
RES_TYPE_COMMON_NAME : Analog
Axle-2 Long Knuckle microstrain
J1708 Road Speed MPH
200
100
0
-100
microstrain
50
40
30
20
10
0
MPH
0
100
200
300
400
Seconds
Build Plot
Reset Plot
Save As JPEG
Save As PNG
Line Style
Solid
Symbol Style
None
Right Click For Chart Customization Dialog - Hold Shift Key Down While Dragging Mouse For Zoom
Include Metadata


Test Item 1
Mon Mar 08 09:53:33 EST 2004 to Mon Mar 08 10:23:34 EST 2004 'D2145333030820044D5400405300BE6D'
Label | Units | UUID | AVG | MAX | MIN | NUMPTS
Road Speed | MPH | 3BA27795418411D6A1B0 | 3.7019 | 49.5 | 0 | 14988
Throttle Position | % | 3BA27797418411D6A1B0 | 9.5888 | 99.6 | 2.8 | 14988
Engine Speed | RPM | 3BA2779F418411D6A1B0 | 870.3943 | 2768.5 | 529.25 | 14988
Total Miles | miles | 3BA277A5418411D6A1B0 | 1589.4011 | 1589.6 | 1587.8 | 188
Trans Range Selected | ASCII | 3BA277A9418411D6A1B0 | | | | 3657
Trans Range Attained | ASCII | 3BA277AA418411D6A1B0 | | | | 3657
Ticker | Tenths Of mSecs | 3BA277D3418411D6A1B0 | 2073753983.0028 | 4177089792 | 484352 | 1801
UTC | DateTime | 3BA277D4418411D6A1B0 | | | | 1801
Latitude | Degrees | 3BA277D5418411D6A1B0 | 39.4595 | 39.4616 | 39.4417 | 1801
Longitude | Degrees | 3BA277D6418411D6A1B0 | -76.1915 | 0 | -76.2054 | 1801
WGS84 Altitude | Meters | 3BA277D7418411D6A1B0 | 17.3537 | 27 | 9 | 1801
Thumbnail Plots | Build a Plot | Attributes | Misc Groups | Misc Images | Non-Numeric Data | Channel Vs Channel Plot | Auto-Validation
UUID | Channel Name | Points
3BA277A9418411D6A1BD000 | Trans Range Selected | 3657
3BA277AA418411D6A1BD000 | Trans Range Attained | 3657
3BA277D4418411D6A1BD000 | UTC | 1801
3BA277DB418411D6A1BD000 | UTM Zone (Latitude) | 1801
Time | Trans Range Selected | Trans Range Attained
154.8832 | 7 | L6
155.3928 | 7 | L6
155.8666 | 7 | L6
156.3678 | 7 | L6
156.8492 | 7 | L6
157.351 | 7 | L6
157.8404 | 7 | L6
158.3346 | 7 | L6
158.8154 | 7 | L6
159.317 | 7 | L6
159.7984 | 7 | L6
160.3044 | 7 | L6
160.7818 | 7 | L6
161.283 | 7 | L7
161.7648 | 7 | L7
162.2844 | 7 | L7
162.7526 | 7 | L7
163.2492 | 7 | L7
163.731 | 7 | L7
164.2322 | 7 | L7
164.727 | 7 | L7
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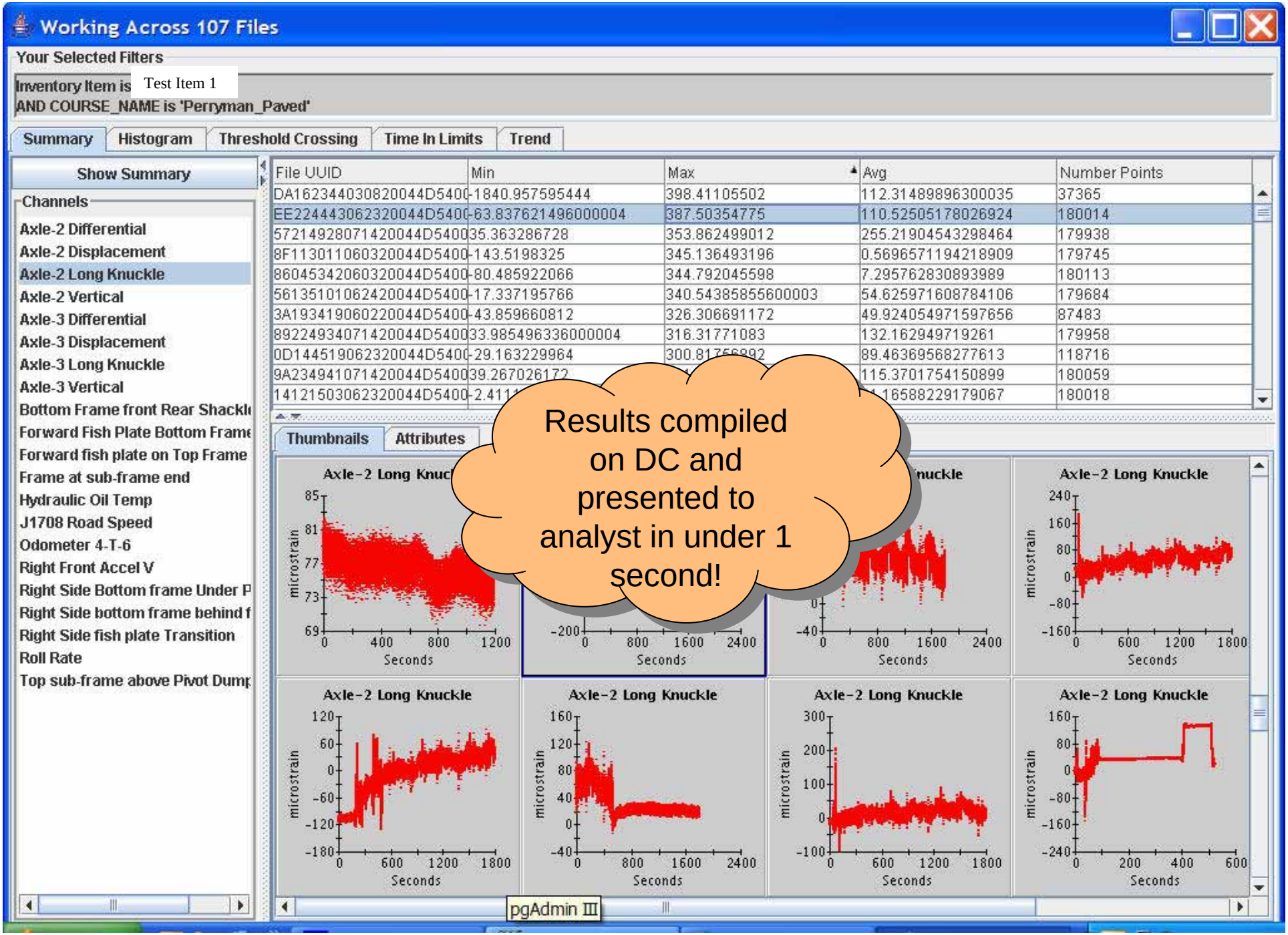
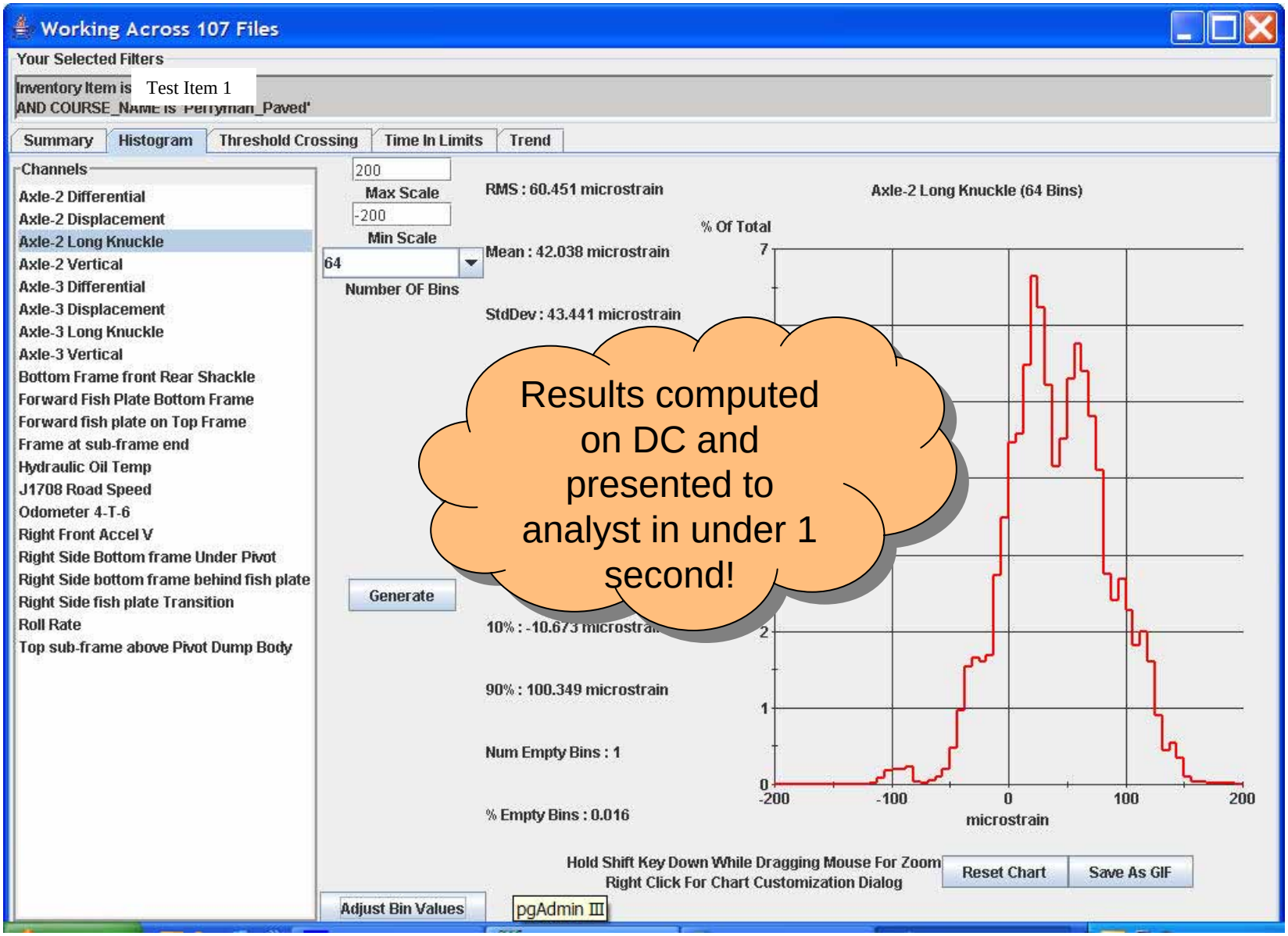
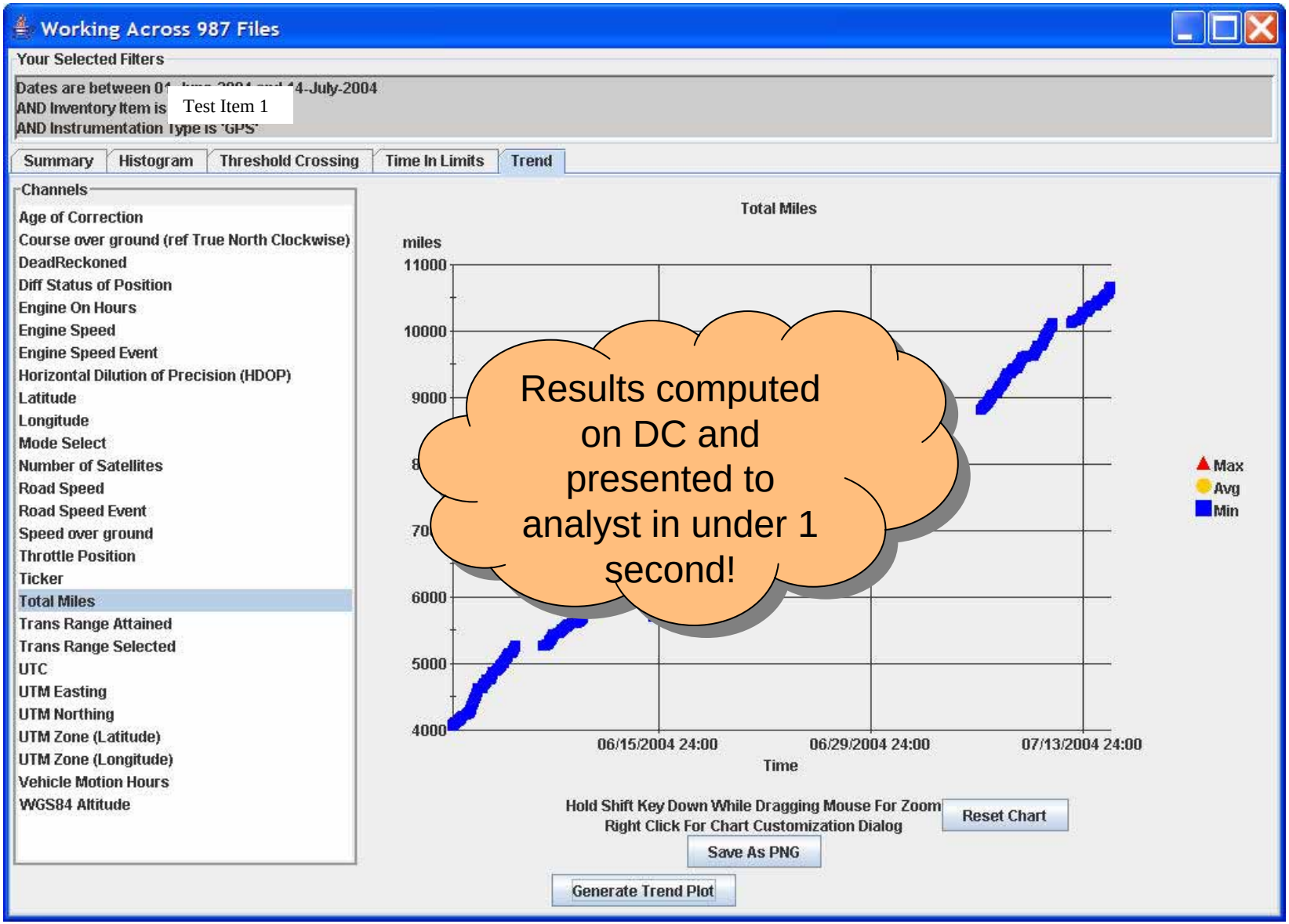
167.195 | 7 | L7
pgAdmin III

UGC 2005

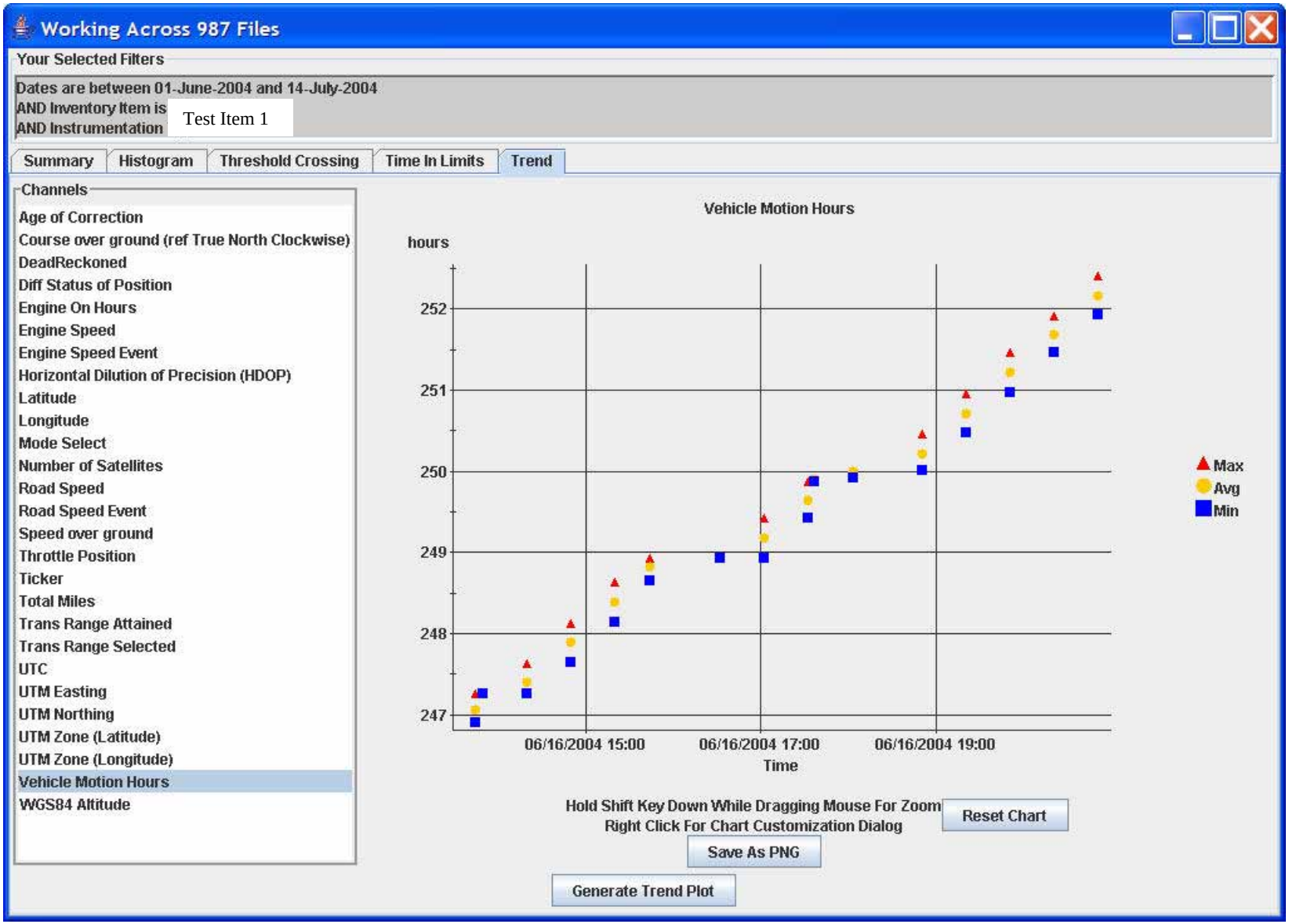

Working Across 107 Files
Your Selected Filters
Inventory Item is Test Item 1
AND COURSE_NAME is 'Perryman_Paved'
Summary
Histogram
Threshold Crossing
Time In Limits
Trend
Show Summary
Channels
Axle-2 Differential
Axle-2 Displacement
Axle-2 Long Knuckle
Axle-2 Vertical
Axle-3 Differential
Axle-3 Displacement
Axle-3 Long Knuckle
Axle-3 Vertical
Bottom Frame front Rear Shackl
Forward Fish Plate Bottom Frame
Forward fish plate on Top Frame
Frame at sub-frame end
Hydraulic Oil Temp
J1708 Road Speed
Odometer 4-T-6
Right Front Accel V
Right Side Bottom frame Under P
Right Side bottom frame behind f
Right Side fish plate Transition
Roll Rate
Top sub-frame above Pivot Dump
File UUID
Min
Max
Avg
Number Points
DA162344030820044D5400 -1840.957595444 398.41105502 112.31489896300035 37365
EE224443062320044D5400 -63.837621496000004 387.50354775 110.52505178026924 180014
57214928071420044D5400 35.363286728 353.862499012 255.21904543298464 179938
8F113011060320044D5400 -143.5198325 345.136493196 0.5696571194218909 179745
86045342060320044D5400 -80.485922066 344.792045598 7.295762830893989 180113
56135101062420044D5400 -17.337195766 340.54385855600003 54.625971608784106 179684
3A193419060220044D5400 -43.859660812 326.306691172 49.924054971597656 87483
89224934071420044D5400 33.985496336000004 316.31771083 132.162949719261 179958
0D144519062320044D5400 -29.163229964 300.81766892 89.46369568277613 118716
9A234941071420044D5400 39.267026172 115.3701754150899 180059
141215030623200 44D5400 -2.411 1.16588229179067 180018
Thumbnails
Attributes
Axle-2 Long Knuckle
microstrain
Seconds
Results compiled on DC and presented to analyst in under 1 second!
pgAdmin III


Working Across 107 Files
Your Selected Filters
Inventory Item is Test Item 1
AND COURSE_NAME is 'Perryman_Paved'
Summary
Histogram
Threshold Crossing
Time In Limits
Trend
Channels
Axle-2 Differential
Axle-2 Displacement
Axle-2 Long Knuckle
Axle-2 Vertical
Axle-3 Differential
Axle-3 Displacement
Axle-3 Long Knuckle
Axle-3 Vertical
Bottom Frame front Rear Shackle
Forward Fish Plate Bottom Frame
Forward fish plate on Top Frame
Frame at sub-frame end
Hydraulic Oil Temp
J1708 Road Speed
Odometer 4-T-6
Right Front Accel V
Right Side Bottom frame Under Pivot
Right Side bottom frame behind fish plate
Right Side fish plate Transition
Roll Rate
Top sub-frame above Pivot Dump Body
200
Max Scale
-200
Min Scale
64
Number OF Bins
Generate
RMS : 60.451 microstrain
Mean : 42.038 microstrain
StdDev : 43.441 microstrain
10% : -10.673 microstrain
90% : 100.349 microstrain
Num Empty Bins : 1
% Empty Bins : 0.016
Axle-2 Long Knuckle (64 Bins)
% Of Total
7
2
1
0
-200
-100
0
100
200
microstrain
Results computed on DC and presented to analyst in under 1 second!
Hold Shift Key Down While Dragging Mouse For Zoom
Right Click For Chart Customization Dialog
Reset Chart
Save As GIF
Adjust Bin Values
pgAdmin III

UGC 2005

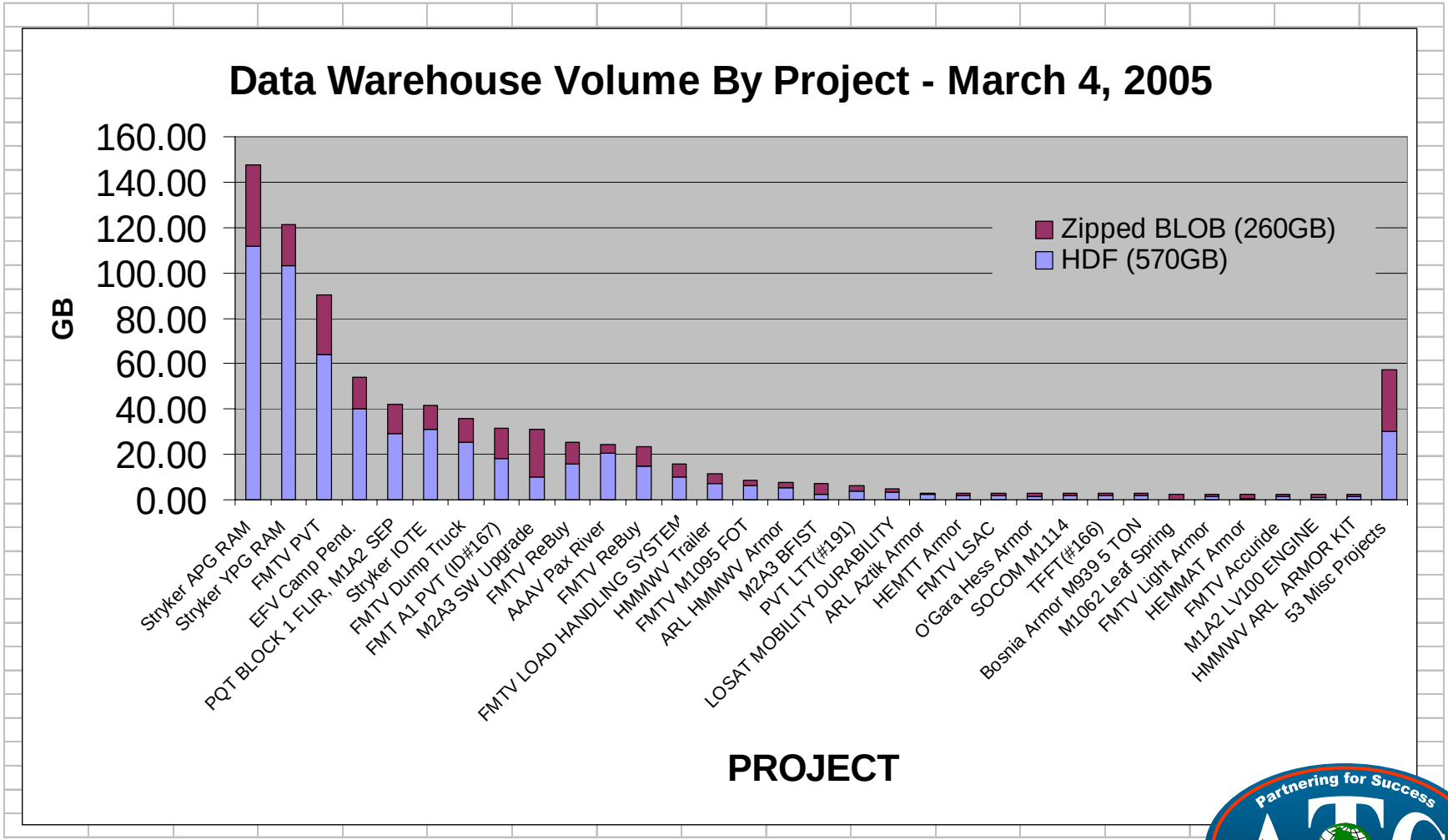

Working Across 987 Files
Your Selected Filters
Dates are between 01 June 2004 and 14-July-2004
AND Inventory Item is Test Item 1
AND Instrumentation Type is 'GPS'
Summary
Histogram
Threshold Crossing
Time In Limits
Trend
Channels
Age of Correction
Course over ground (ref True North Clockwise)
DeadReckoned
Diff Status of Position
Engine On Hours
Engine Speed
Engine Speed Event
Horizontal Dilution of Precision (HDOP)
Latitude
Longitude
Mode Select
Number of Satellites
Road Speed
Road Speed Event
Speed over ground
Throttle Position
Ticker
Total Miles
Trans Range Attained
Trans Range Selected
UTC
UTM Easting
UTM Northing
UTM Zone (Latitude)
UTM Zone (Longitude)
Vehicle Motion Hours
WGS84 Altitude
Total Miles
miles
11000
10000
9000
6000
5000
4000
06/15/2004 24:00
06/29/2004 24:00
07/13/2004 24:00
Time
Max
Avg
Min
Results computed on DC and presented to analyst in under 1 second!
Hold Shift Key Down While Dragging Mouse For Zoom
Right Click For Chart Customization Dialog
Reset Chart
Save As PNG
Generate Trend Plot

UGC 2005


Working Across 987 Files
Your Selected Filters
Dates are between 01-June-2004 and 14-July-2004
AND Inventory Item is
AND Instrumentation
Test Item 1
Summary
Histogram
Threshold Crossing
Time In Limits
Trend
Channels
Age of Correction
Course over ground (ref True North Clockwise)
DeadReckoned
Diff Status of Position
Engine On Hours
Engine Speed
Engine Speed Event
Horizontal Dilution of Precision (HDOP)
Latitude
Longitude
Mode Select
Number of Satellites
Road Speed
Road Speed Event
Speed over ground
Throttle Position
Ticker
Total Miles
Trans Range Attained
Trans Range Selected
UTC
UTM Easting
UTM Northing
UTM Zone (Latitude)
UTM Zone (Longitude)
Vehicle Motion Hours
WGS84 Altitude
Vehicle Motion Hours
hours
252
251
250
249
248
247
06/16/2004 15:00
06/16/2004 17:00
06/16/2004 19:00
Time
Max
Avg
Min
Hold Shift Key Down While Dragging Mouse For Zoom
Right Click For Chart Customization Dialog
Reset Chart
Save As PNG
Generate Trend Plot

Institute a high performance data warehouse

Over 80 projects using Data Warehouse



ATC DC Proposal

- Achieve real-time data fusion to provide real-time analytic and decision support

- Establish parallel post processing capabilities to effect knowledge extraction

- Institute a high performance data warehouse

- Real time quality control – utilizing historic data sets

Real time quality control – utilizing historic data sets

- New data sets compared with warehoused data from the same channel/test item for anomaly detection.
- Future Work

Summary

- Parallel java applications are running very well on cluster.
- Polling vs. interrupt (event) driven processing not ideal – but workable.
- ARL MSRC administering the system is ideal.
- Data warehouse access requiring kerberos/secureID does not fit well with our current Digital Library project based authentication. ATC customers must obtain HPCMP account in order to use data warehouse (they don't even know they are using HPCMP assets).
- *Special thanks to Tom Kendall, Chris Slaughter and Ryan Baxter at ARL-MSRC for assistance every step of the way!*

Partnering For Success